

U.S. Spaceflight

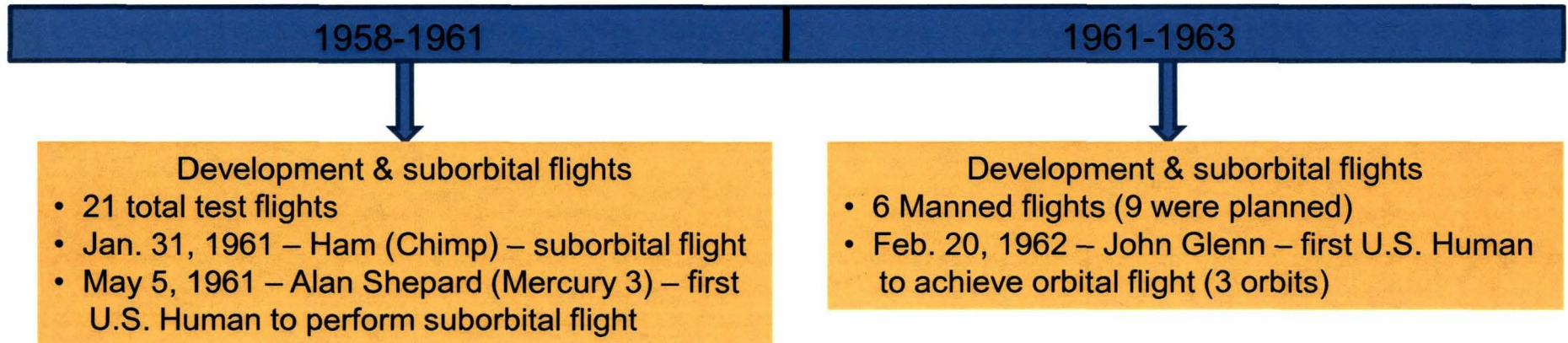
Kim Guodace

Kennedy Space Center

Former Shuttle Engineer

History of Spaceflight

- Mercury
 - First U.S. Human Spaceflight program (1958-1963)
 - Goal: to place a Human in Earth Orbit



History of Spaceflight

- September 12, 1962 at Rice University
 - President John F. Kennedy set a goal for the United States to place a man on the moon by the end of the 1960's



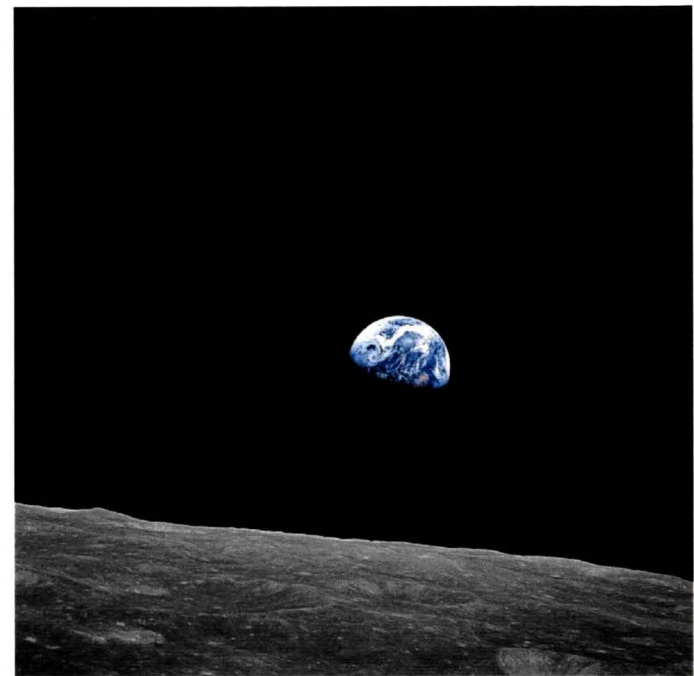
History of Spaceflight

- Gemini
 - 2nd U.S. Human Spaceflight Program (1965-1966)
 - 2 Unmanned test flights
 - 10 Manned flights
 - Develop techniques for future space travel, including missions to the moon
 - First spacewalk (Gemini IV), first rendezvous docking (Gemini VI/VII)



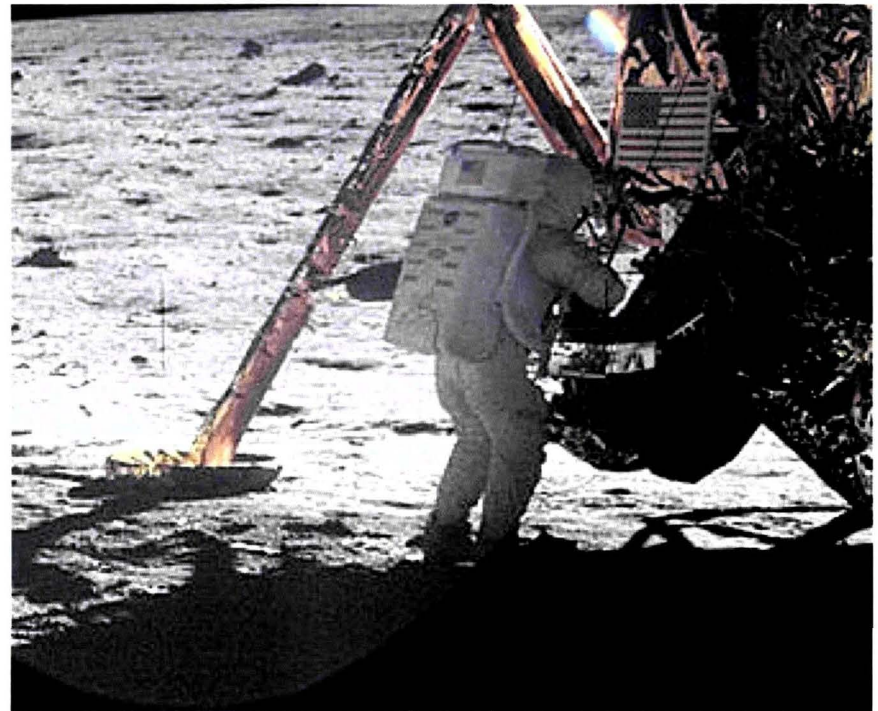
History of Spaceflight

- Apollo 7 – October 11, 1968
 - Man orbited Earth testing out systems for a moon mission
- Apollo 8 – December 21, 1968
 - Man reached Moon Orbit for the first time in history
 - First time an “Earth Rise” was ever seen
- Apollo 9 (March 3, 1969) and Apollo 10 (May 18, 1969)
 - Additional Moon orbiting flights testing out systems in preparation for moon landing



History of Spaceflight

- Apollo 11 – July 16, 1969
 - Neil Armstrong - first man to step on the surface of the moon



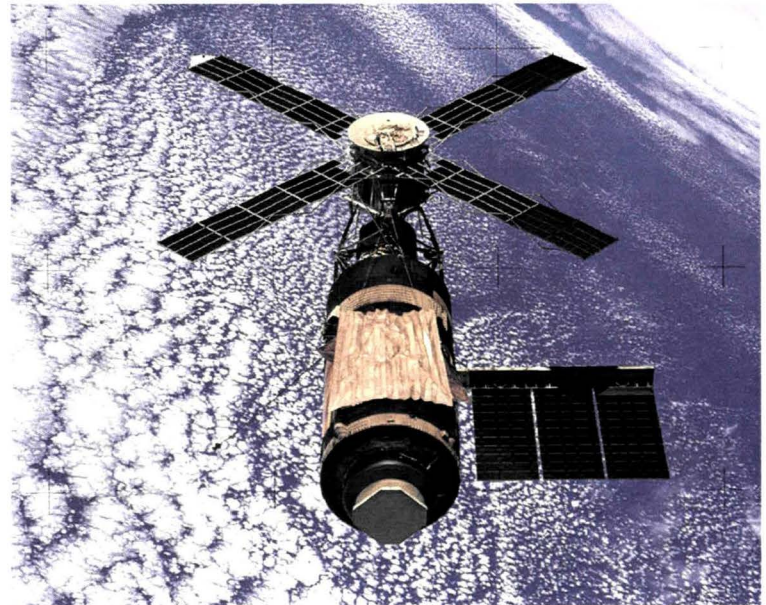
History of Spaceflight

- Apollo 12 – November 14, 1969
 - 2nd landing on the moon
- Apollo 13 – April 11, 1970
 - Oxygen tank exploded, crew never landed on the moon



History of Spaceflight

- Apollo 14-17 – January 1971 thru December 1972
 - 4 final missions to the moon
- Last three missions cancelled due to budget cuts
- Salyut (1971 thru early 1980's)
 - First orbiting “Space Station”
- Skylab
 - First orbiting United States “Space Station”
 - Flew from 1973 thru 1979
 - Visited by 3 crews



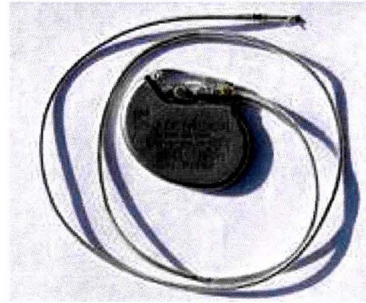
History of Spaceflight

- Space Shuttle (1981-Present)
 - April 12, 1981 – first Space Shuttle Flight - Columbia
 - John Young and Bob Crippen
 - 135 missions
 - 6 Orbiters
 - Enterprise (USS Intrepid, New York City)
 - Challenger (Cape Canaveral AFS)
 - Columbia (Vehicle Assembly Building, KSC, FL)
 - Discovery (Smithsonian, Dullus, VA)
 - Atlantis (Kennedy Space Center, FL)
 - Endeavour (to be delivered to California Science Center in Los Angeles – October 2012)

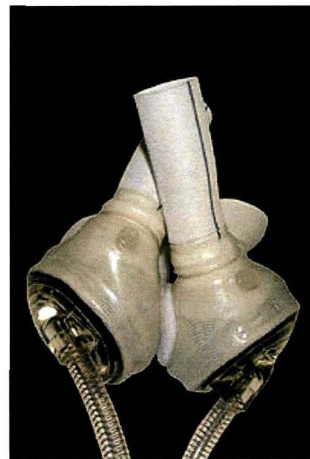
How many of you...



Know someone with a pacemaker?

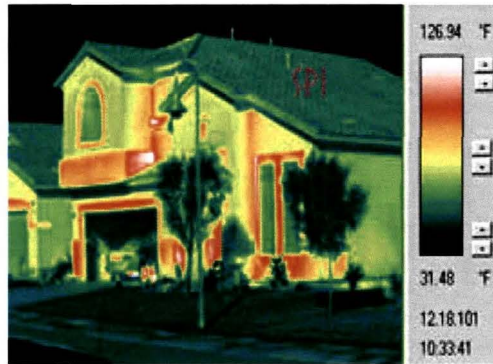


Have heard of the Artificial Heart?



How many of you...

📷 Have seen images from an Infrared Camera?









📷 Have heard of the Jaws of Life?









Space Shuttles vs. Rockets

Space Shuttles

-  Two stage
-  Man rated
-  Larger payloads
-  Government
-  Reusable
-  Fly only from Florida

Rockets

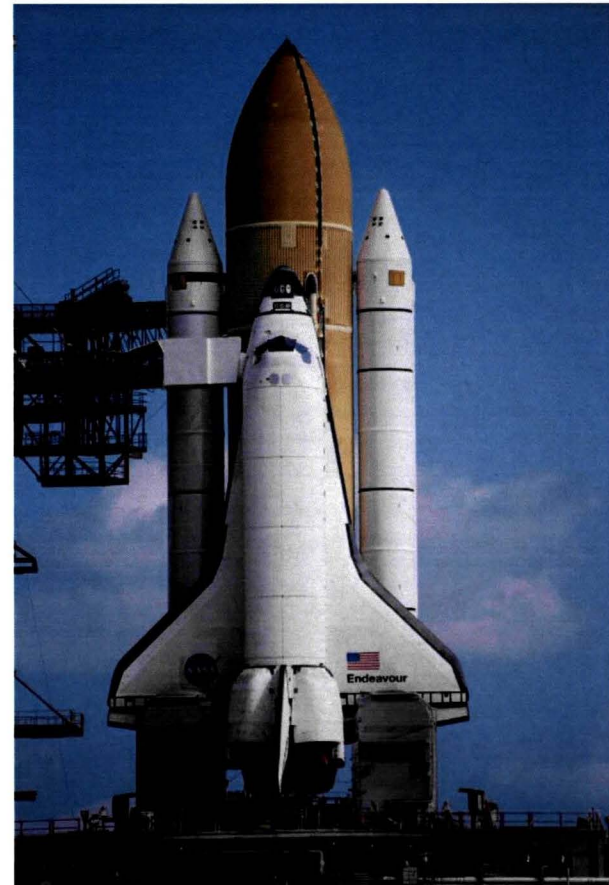
-  Single or double stage
-  Not man rated
-  Smaller Payloads
-  Commercial and Government
-  One time use
-  Fly from several locations around the world

Orbiter vs. Space Shuttle

Orbiter



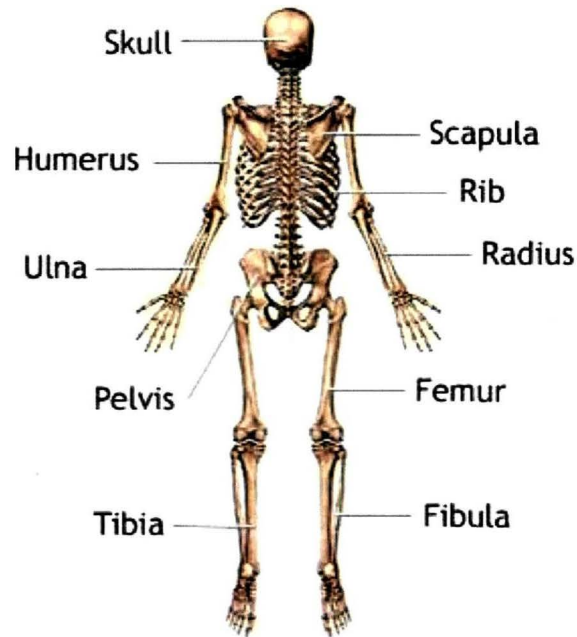
Space Shuttle



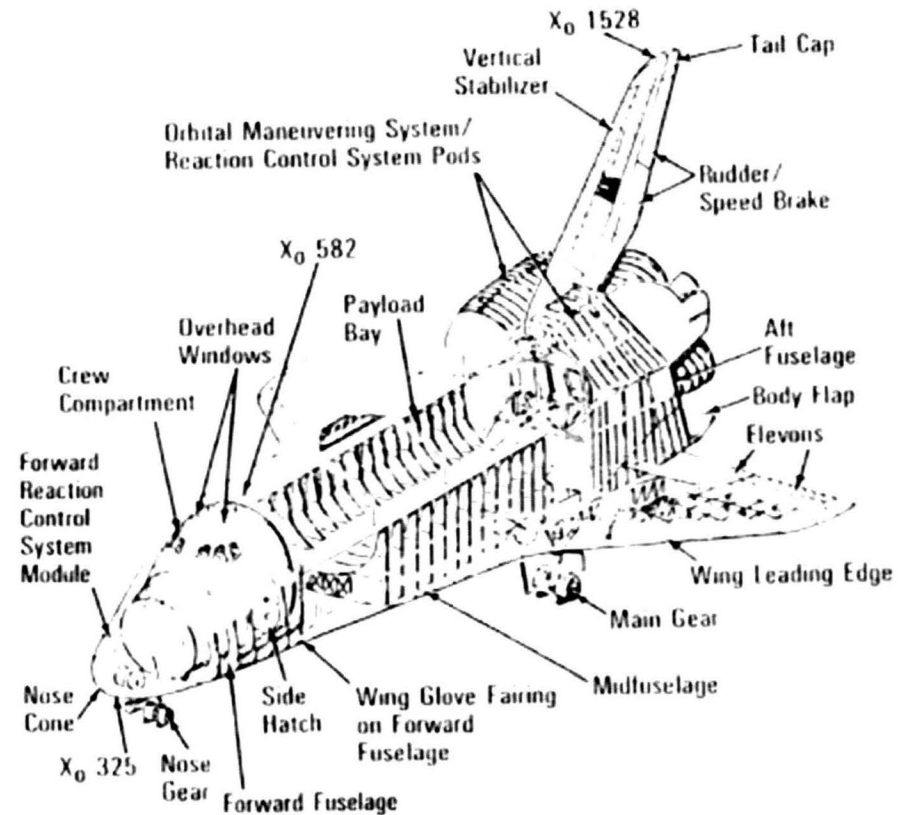
Human vs. Shuttle Systems

Skeletal

Human



Orbiter

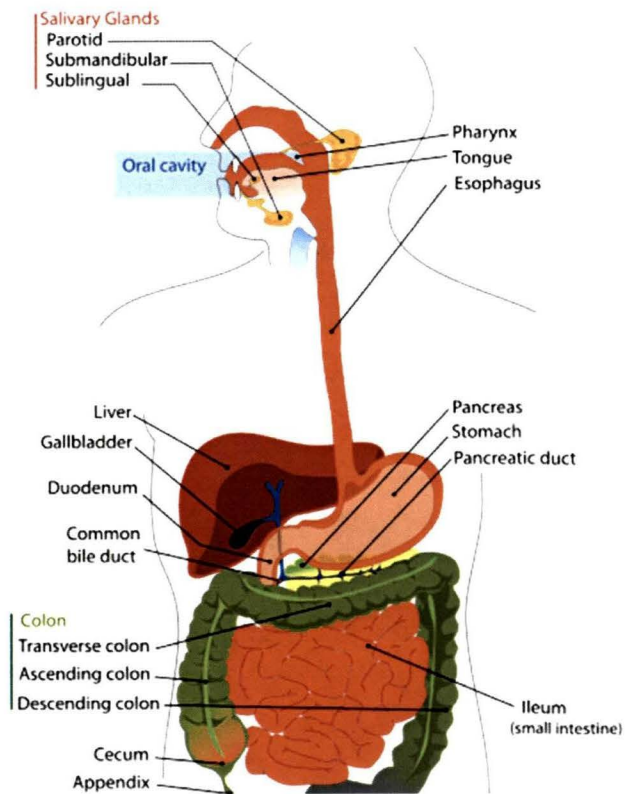


Orbiter

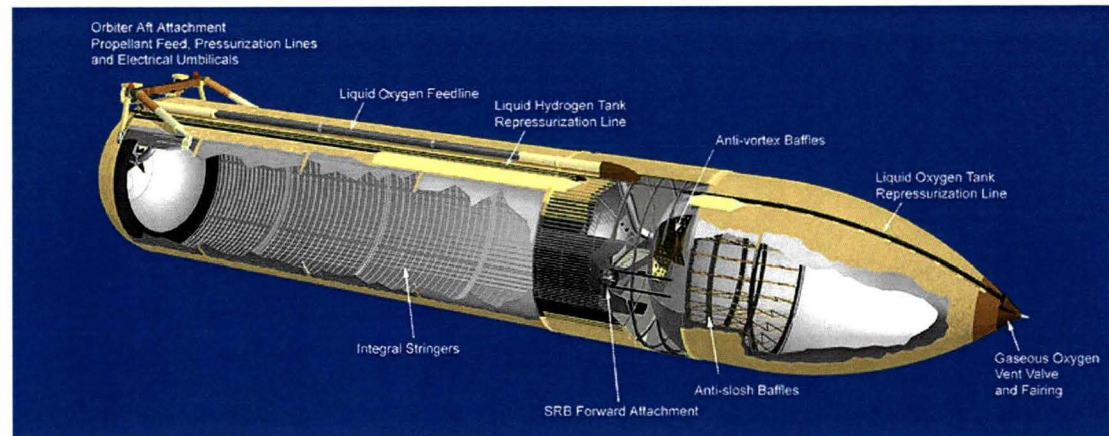
Human vs. Shuttle Systems

Digestive

Human



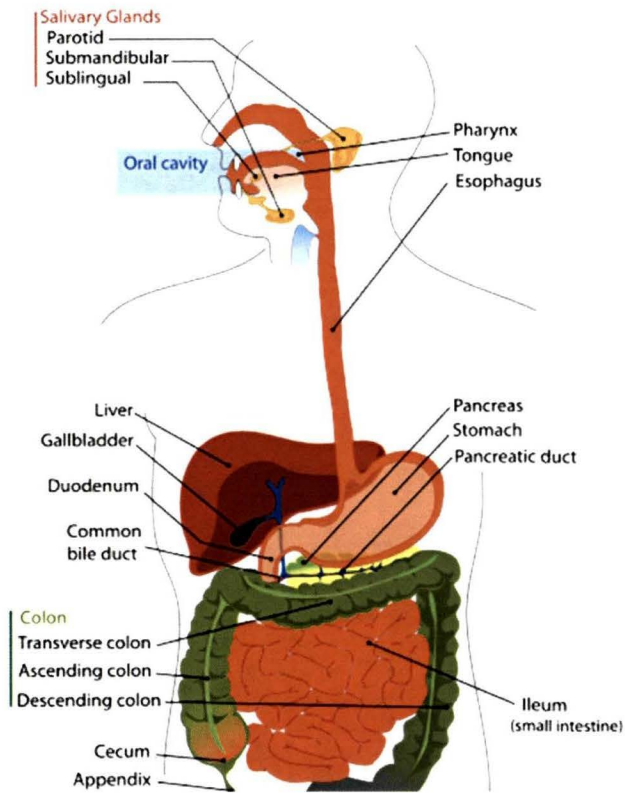
Shuttle



Human vs. Shuttle Systems

Digestive

Human



Orbiter

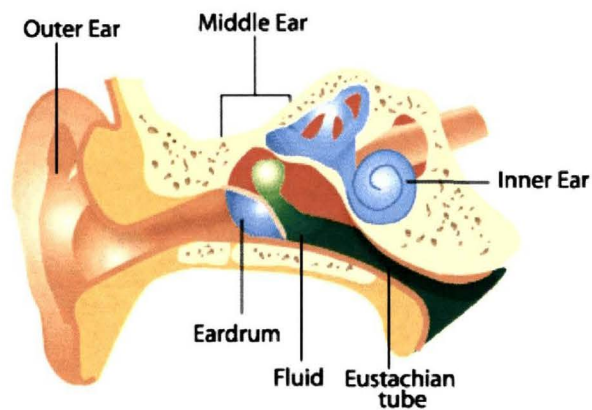
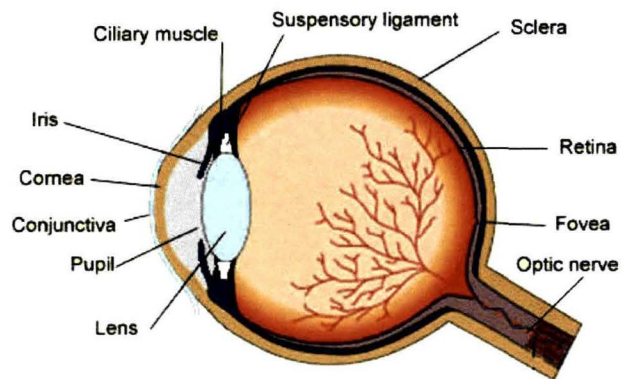


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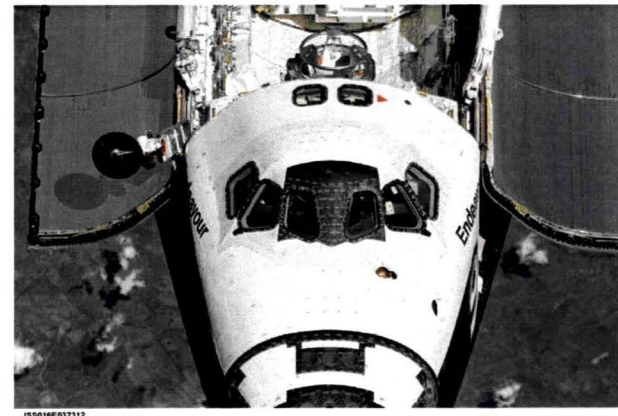
Human vs. Shuttle Systems

Senses

Human



Shuttle



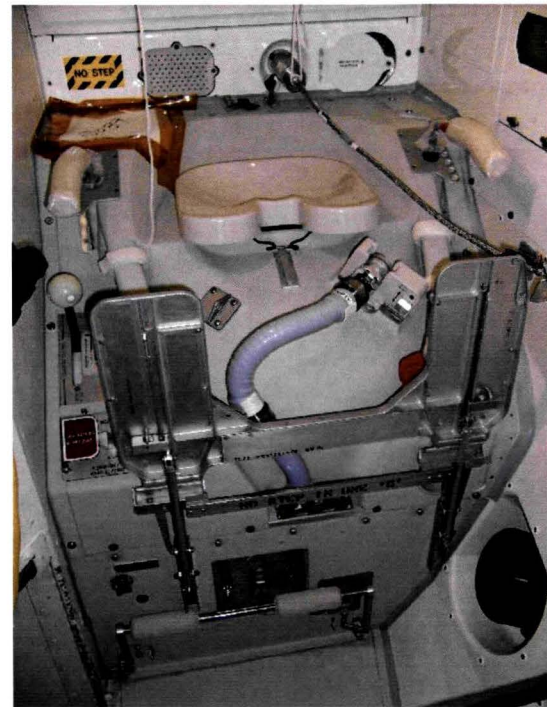
Human vs. Shuttle Systems

Waste Management

Human



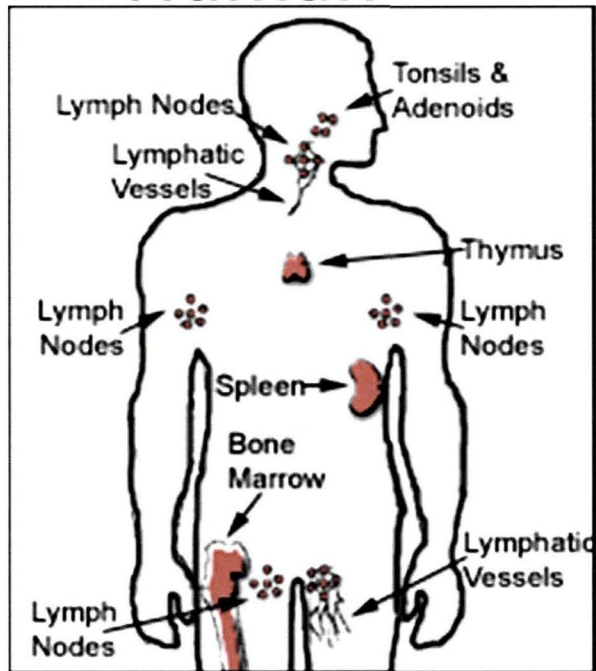
Shuttle



Human vs. Shuttle Systems

Health

Human



Shuttle

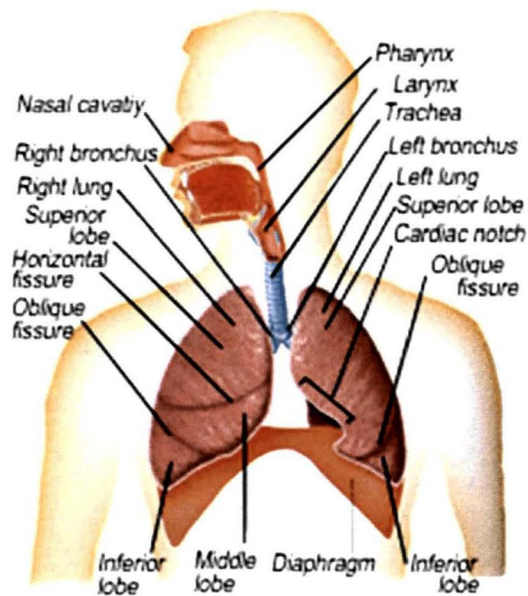


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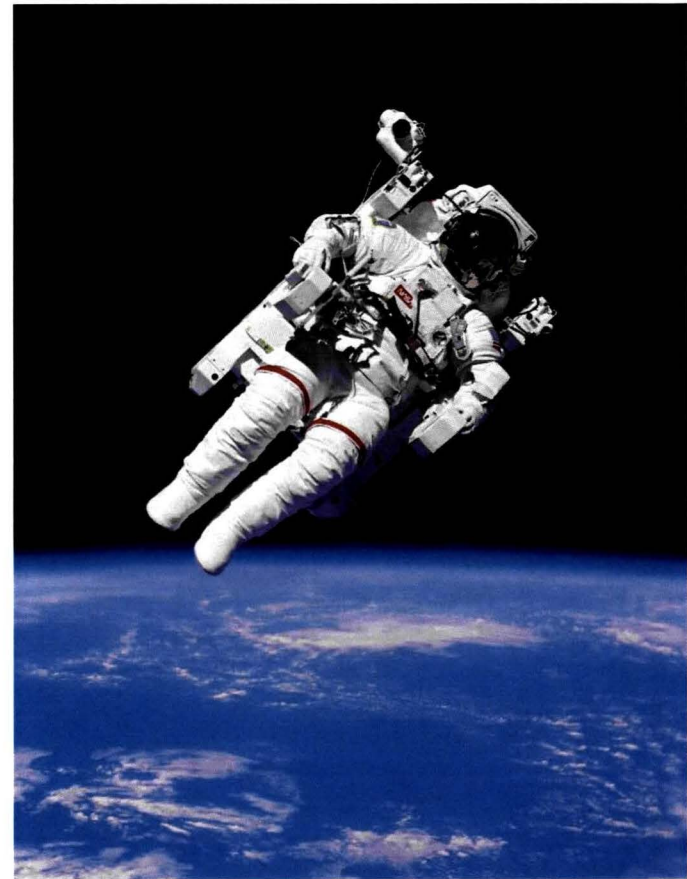
Human vs. Shuttle Systems

Respiratory

Human



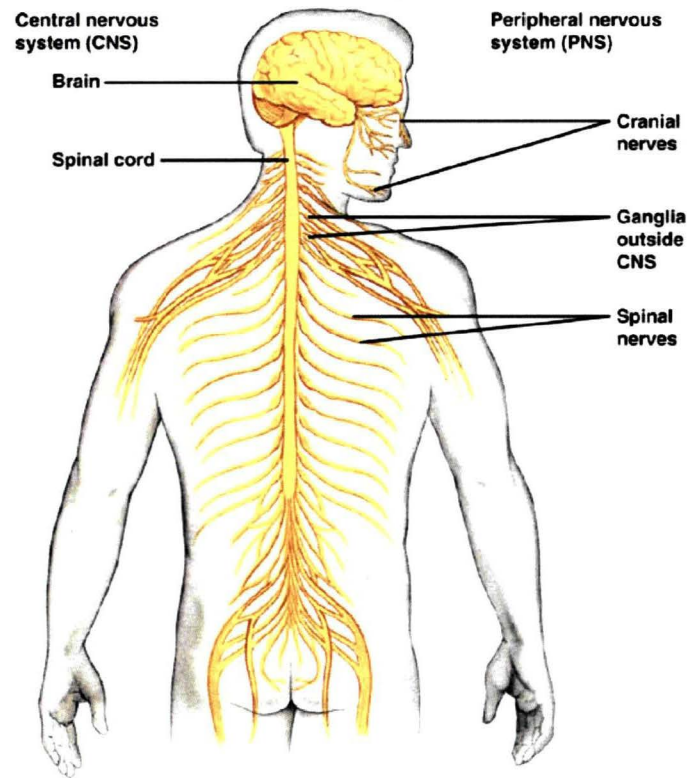
Shuttle



Human vs. Shuttle Systems

Nervous

Human



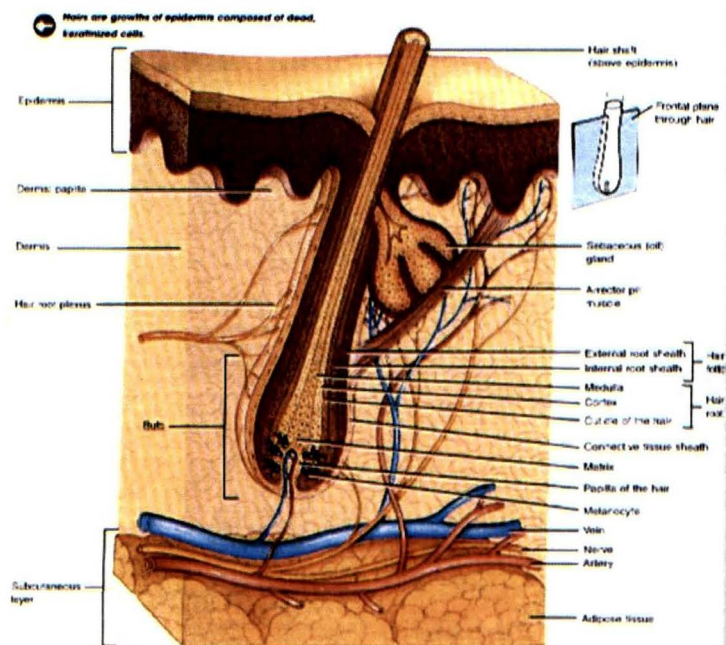
Shuttle



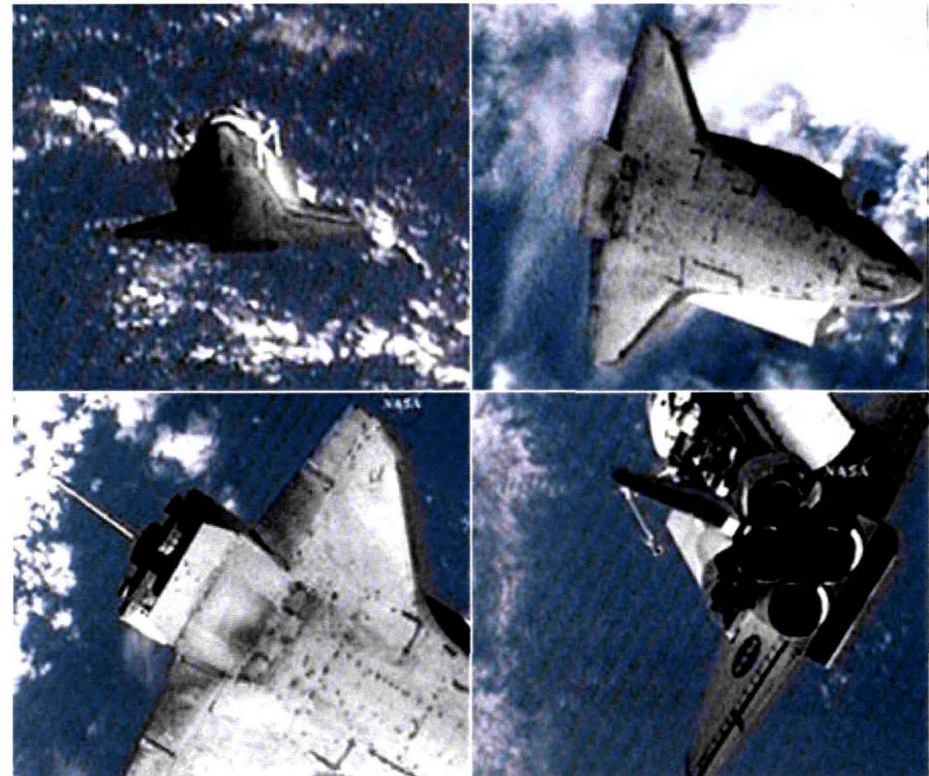
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Integumentary

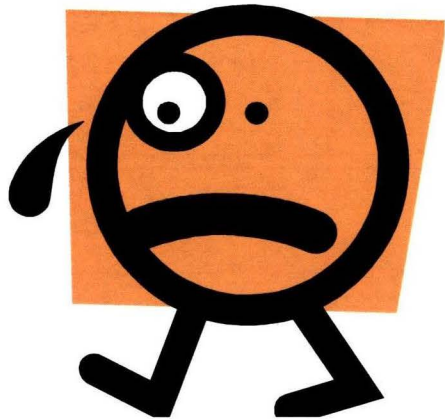
Human



Shuttle



Human Emotions



Emotional Side of Human Spaceflight

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 - Edward White
 - Roger Chaffee



Emotional Side of Human Spaceflight

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 - 73 seconds after launch
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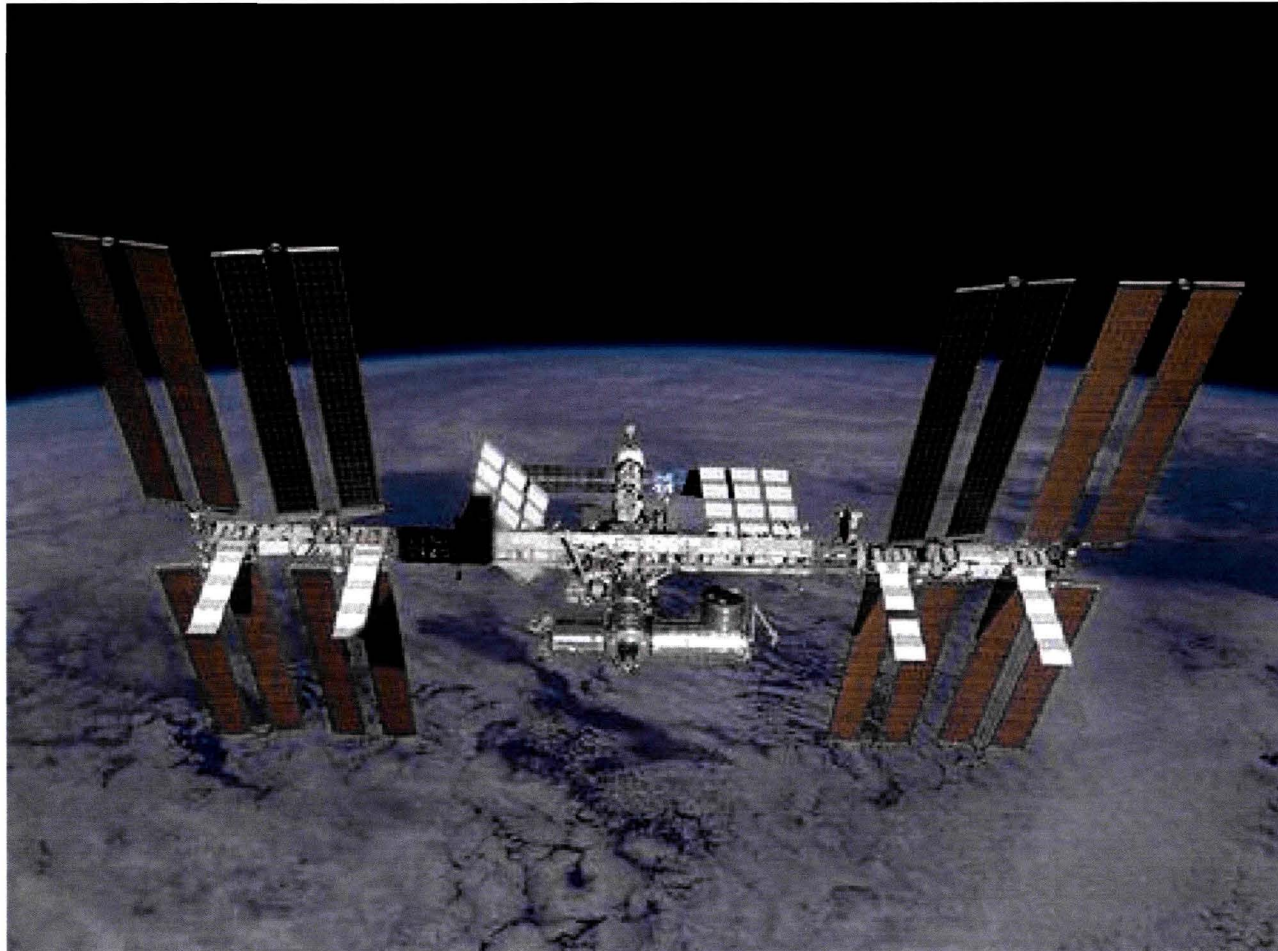


Emotional Side of Human Spaceflight

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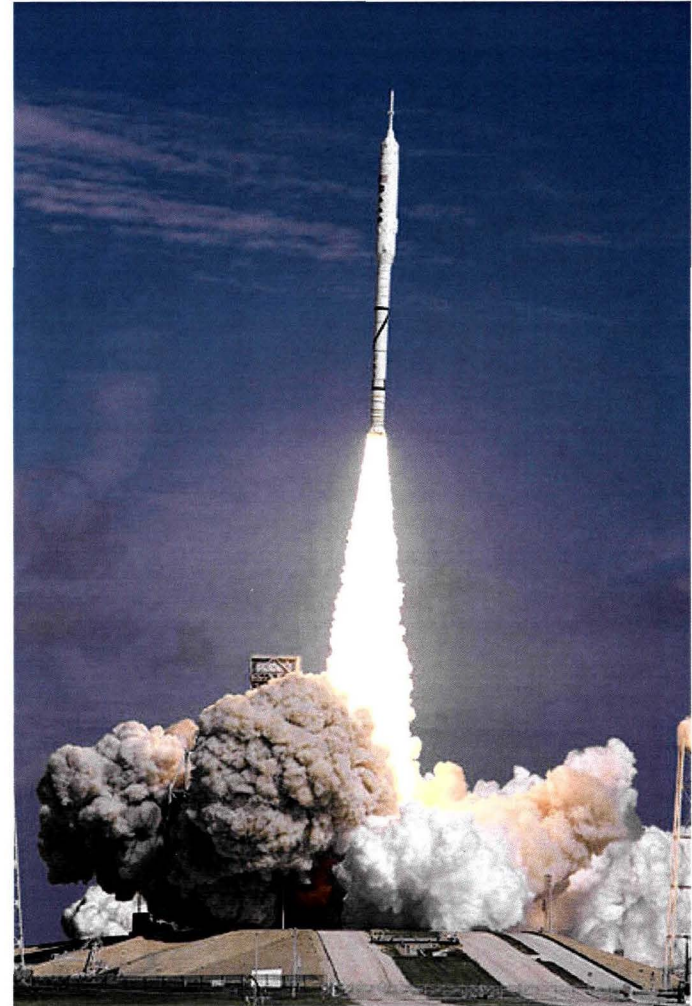


International Space Station



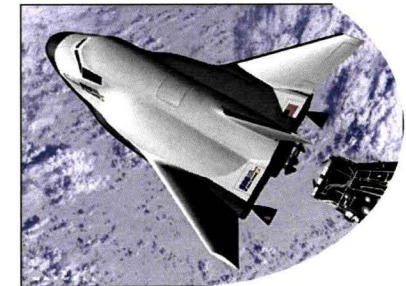
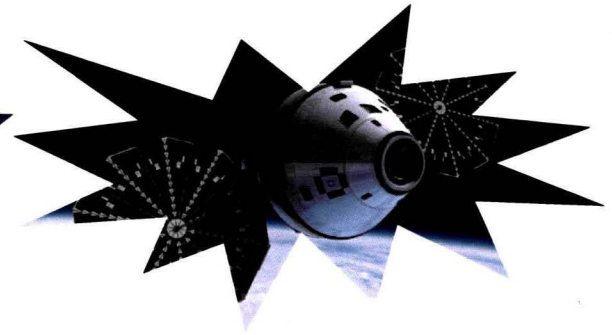
Future of Human Spaceflight

- Ares 1-X
 - Test vehicle for the Constellation Program aimed at returning Humans to the moon and on to Mars
 - Test flight occurred on October 28, 2009
 - Program cancelled on October 11, 2010



Future of Human Spaceflight

- NASA Programs
 - SLS
 - Orion
- Commercial Ventures
 - SpaceX
 - Sierra Nevada
 - ULA
 - Boeing





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1958-1961

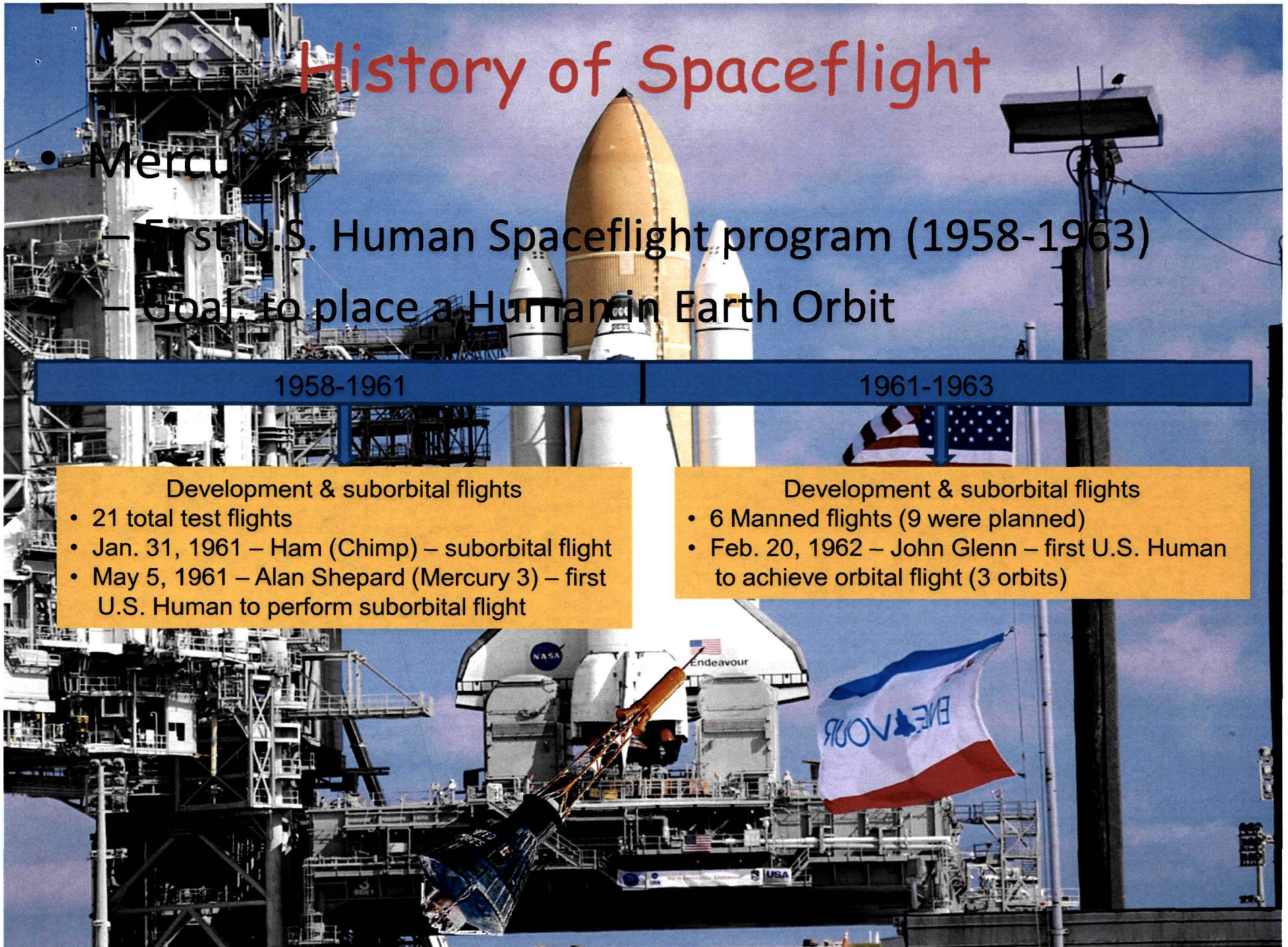
Development & suborbital flights

- 21 total test flights
- Jan. 31, 1961 – Ham (Chimp) – suborbital flight
- May 5, 1961 – Alan Shepard (Mercury 3) – first U.S. Human to perform suborbital flight

1961-1963

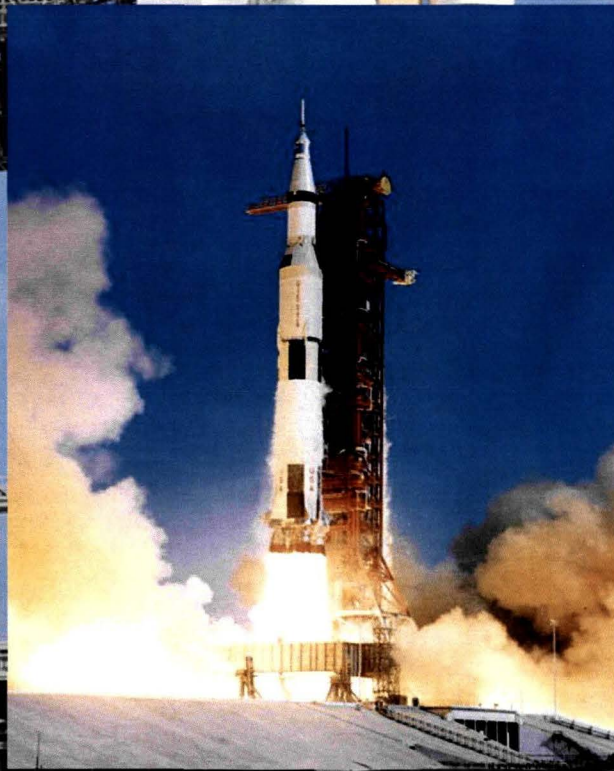
Development & suborbital flights

- 6 Manned flights (9 were planned)
- Feb. 20, 1962 – John Glenn – first U.S. Human to achieve orbital flight (3 orbits)



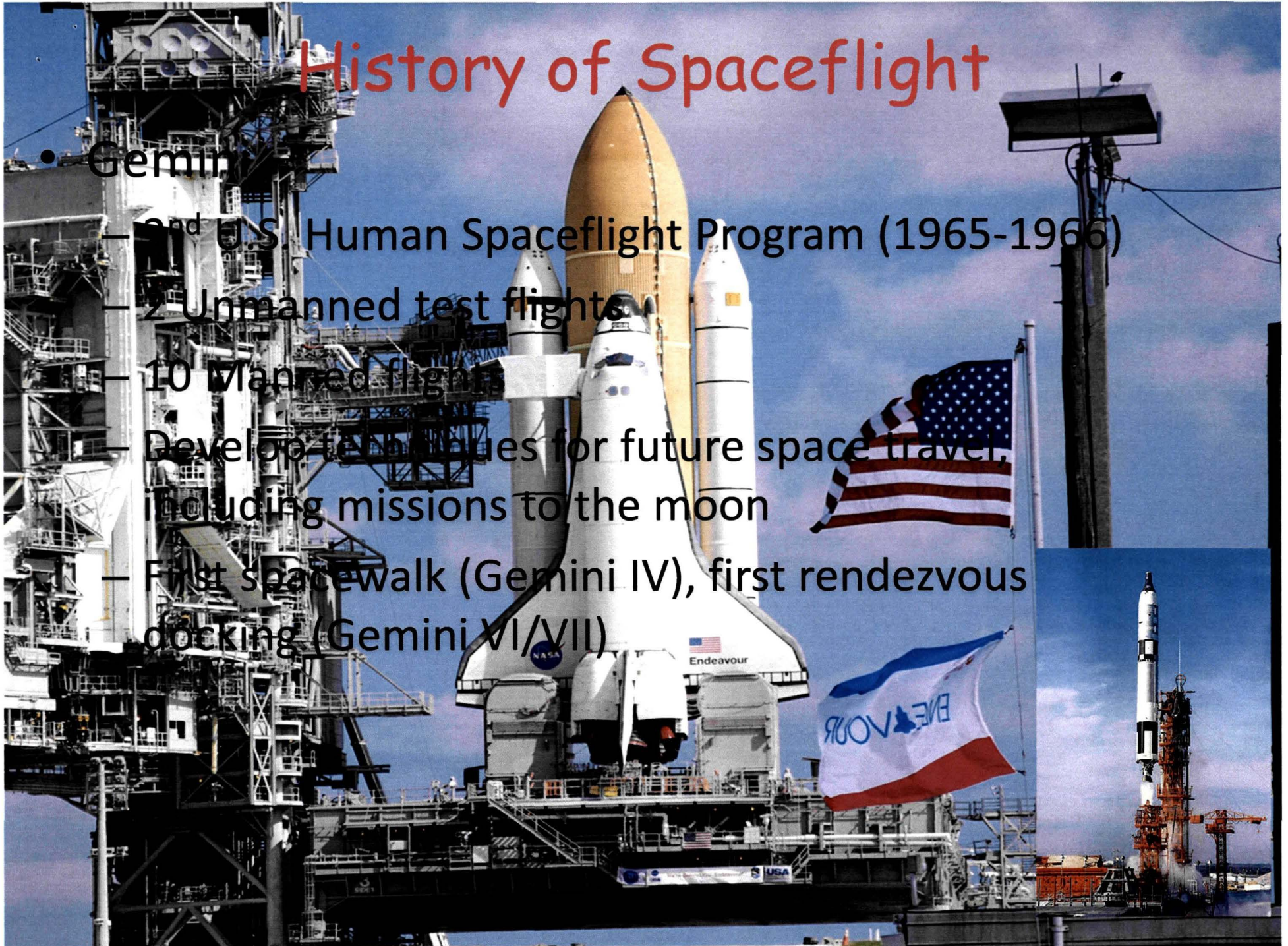
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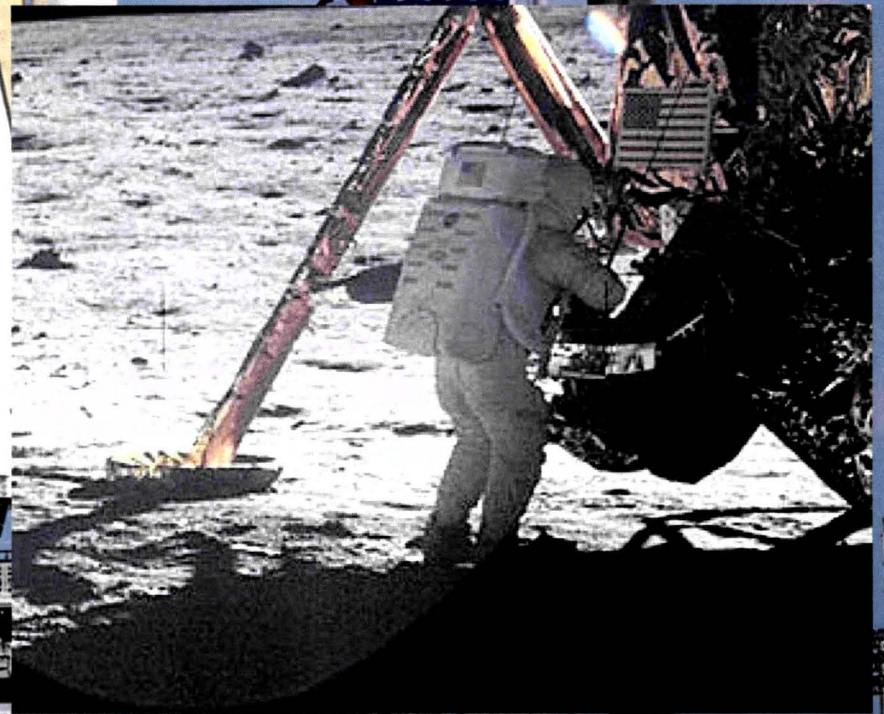
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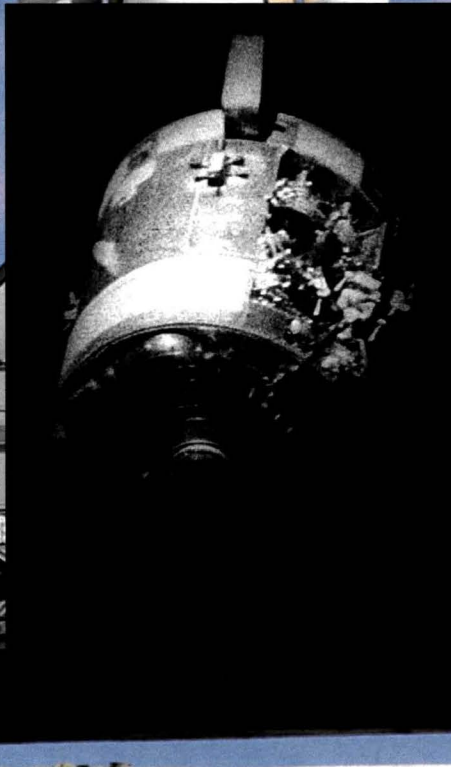
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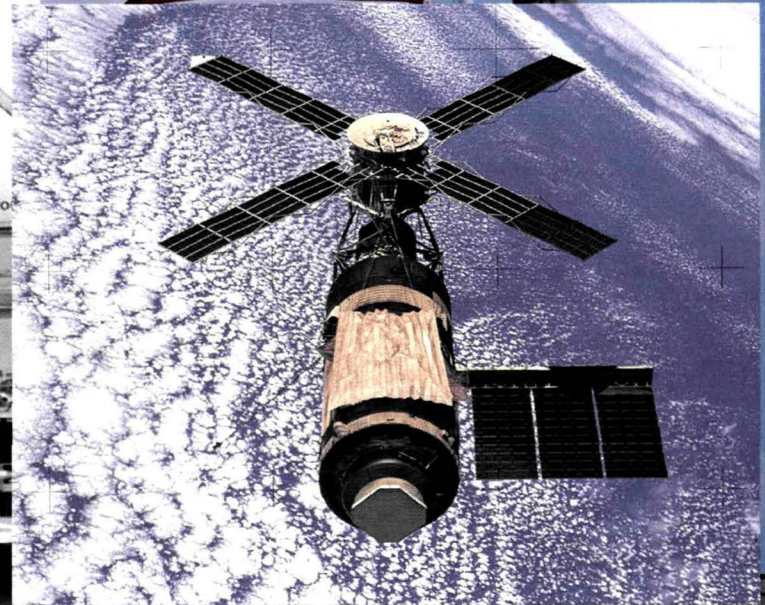
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- Enterprise (USS Intrepid, New York City)

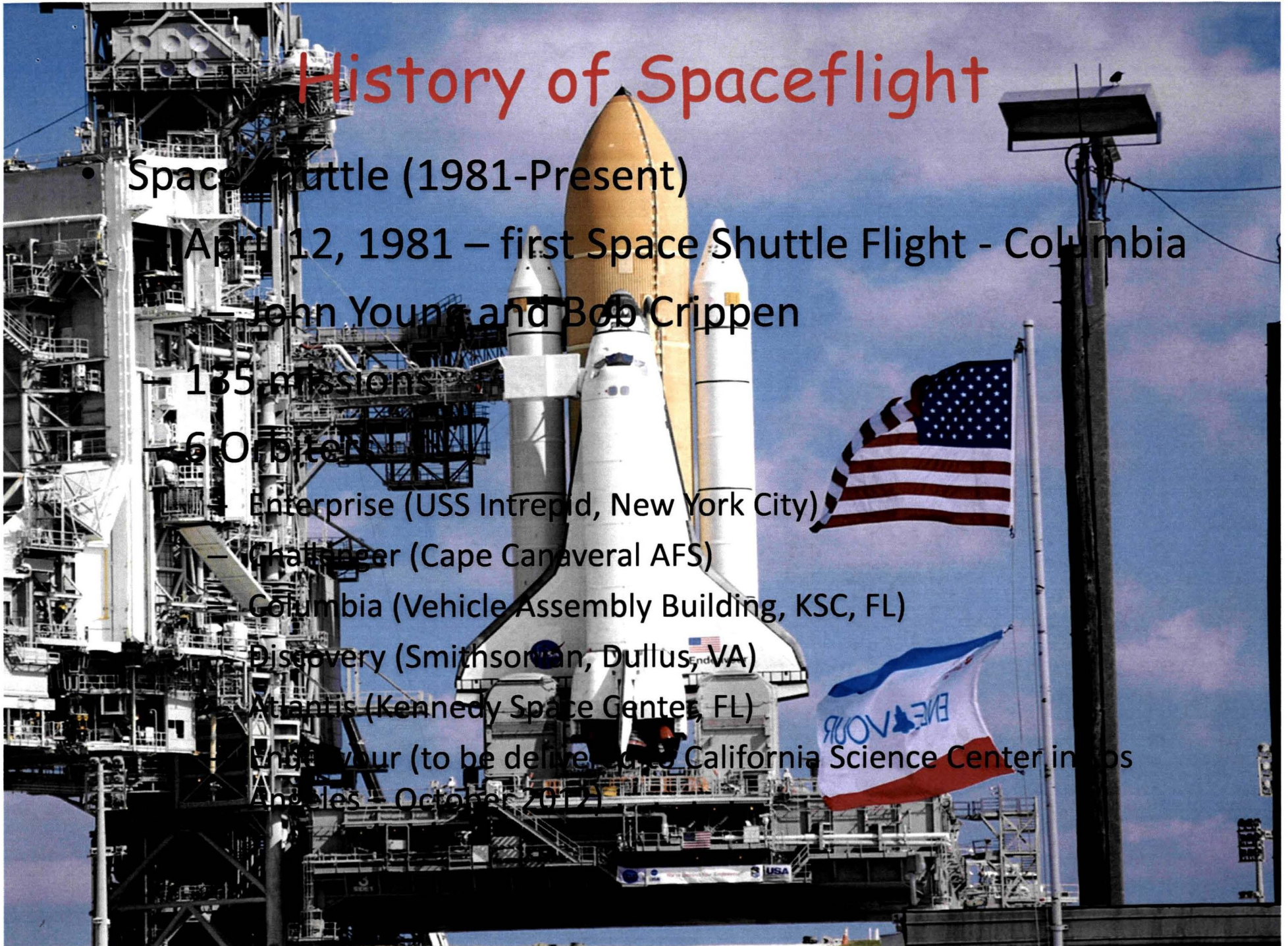
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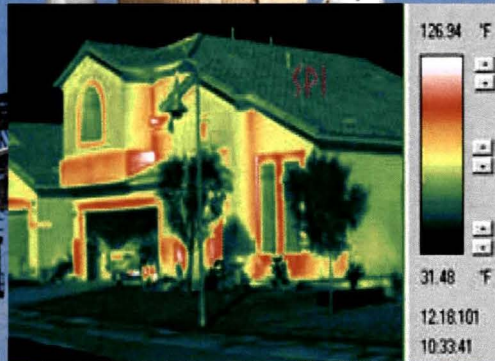
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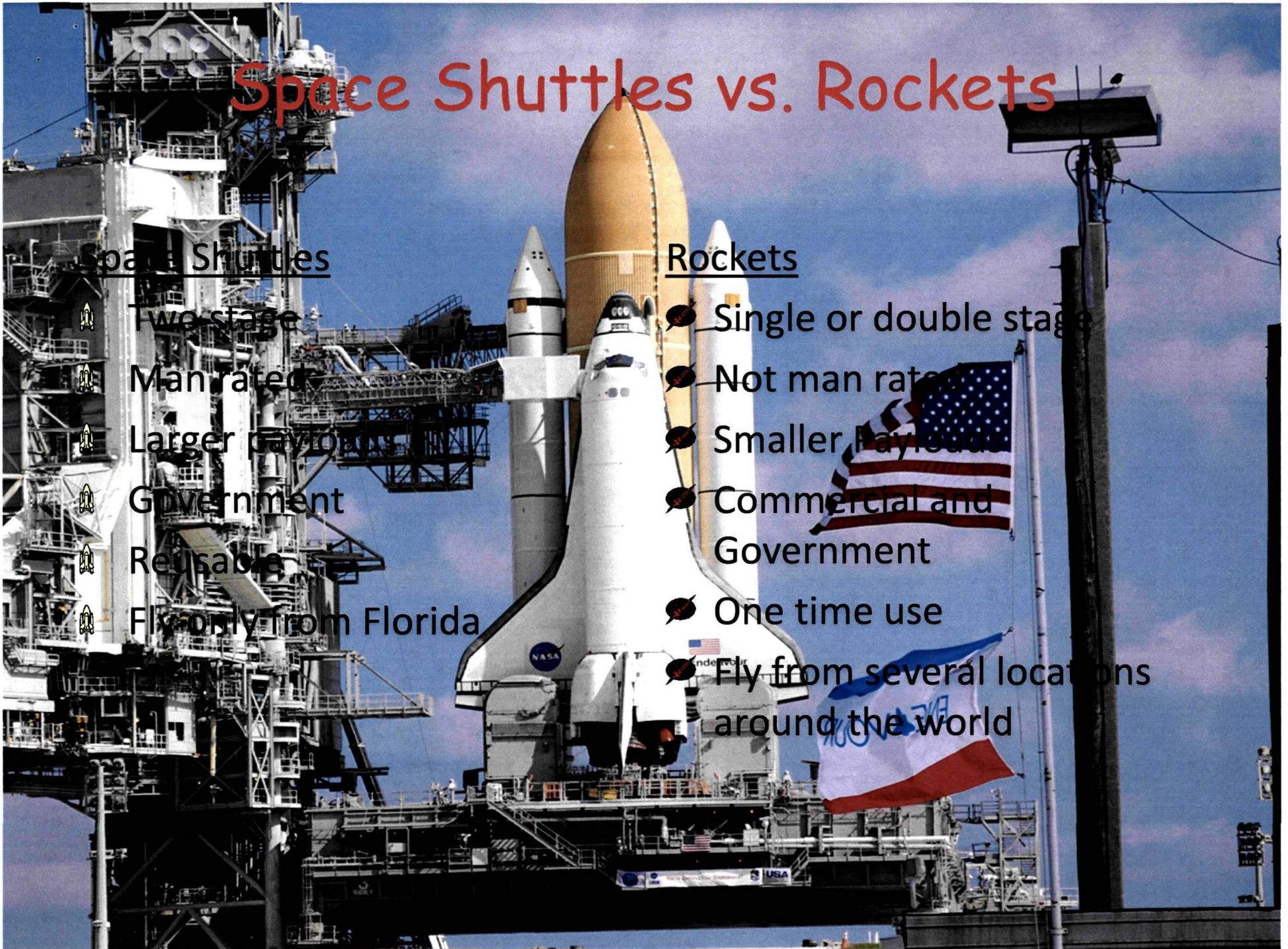
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- 🚀 Government
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- 🚀 Fly only from Florida

Rockets

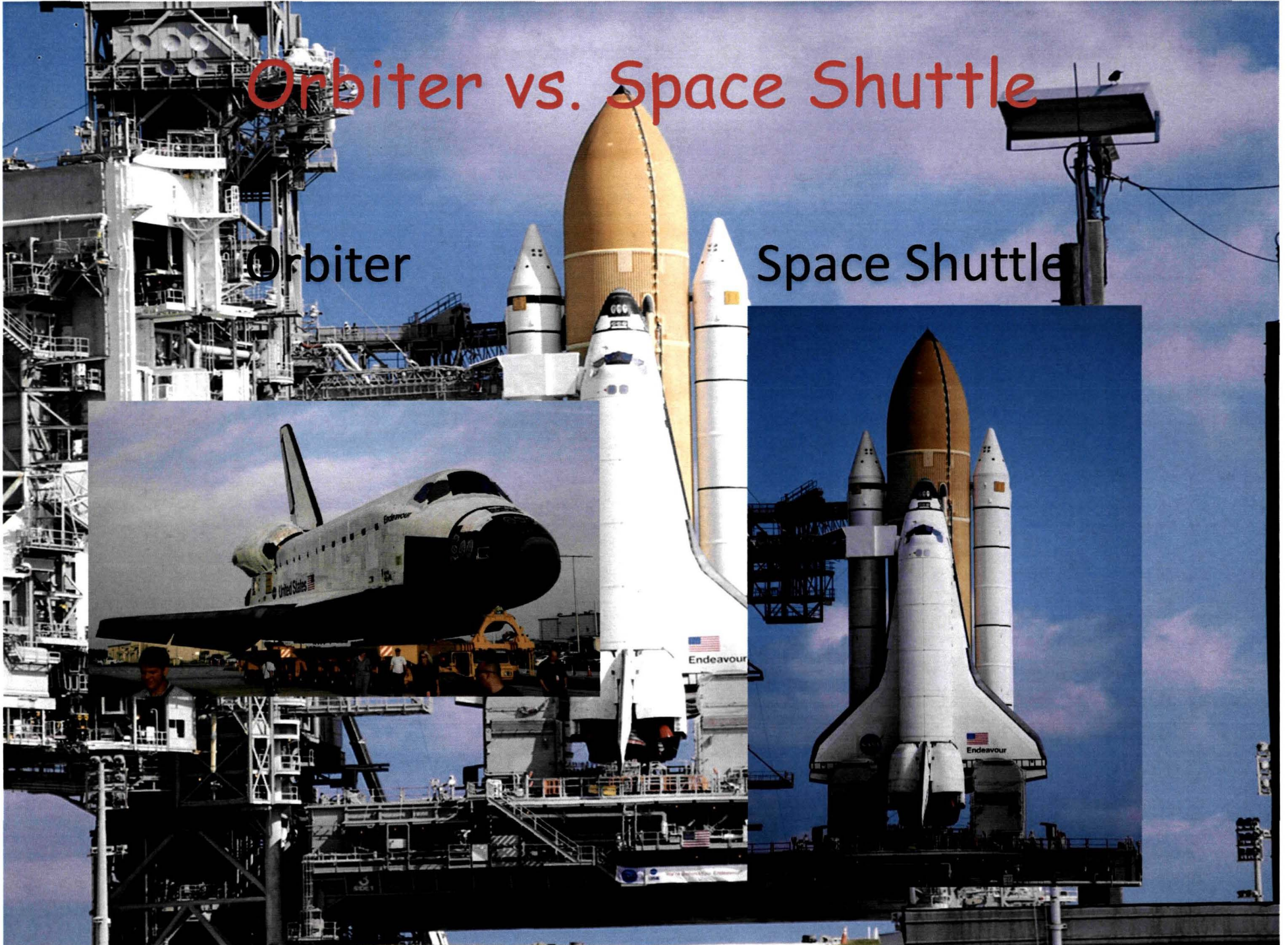
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Orbiter vs. Space Shuttle

Orbiter

Space Shuttle

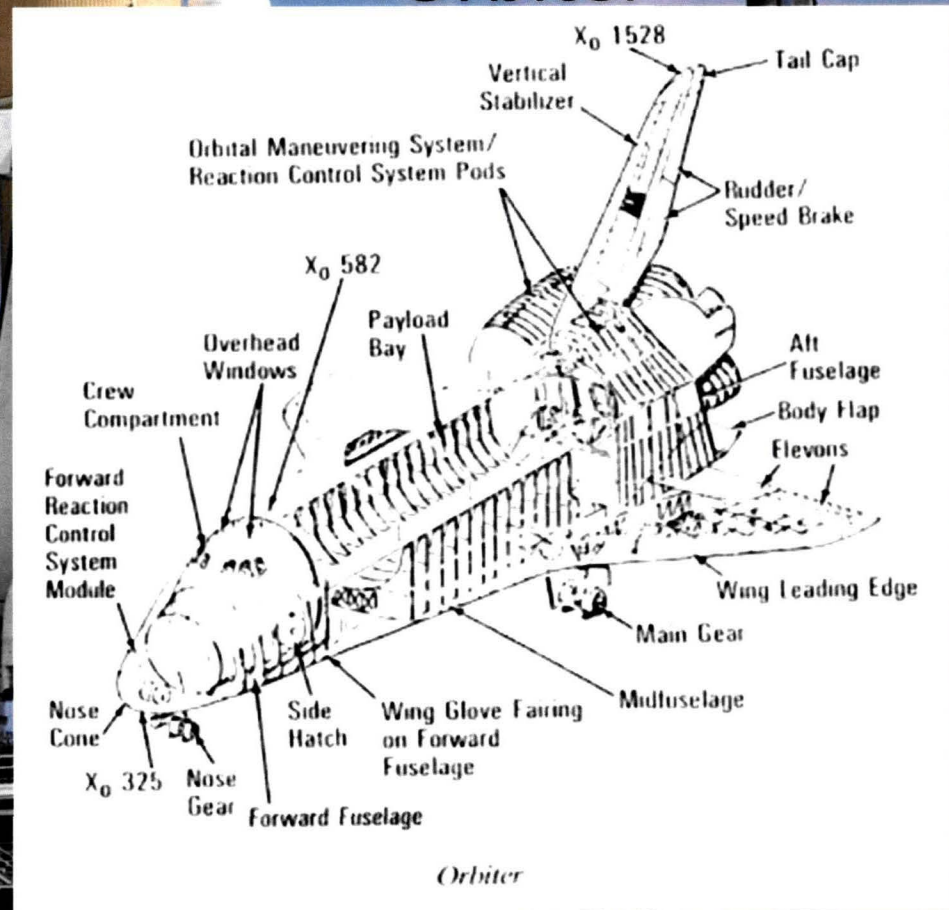
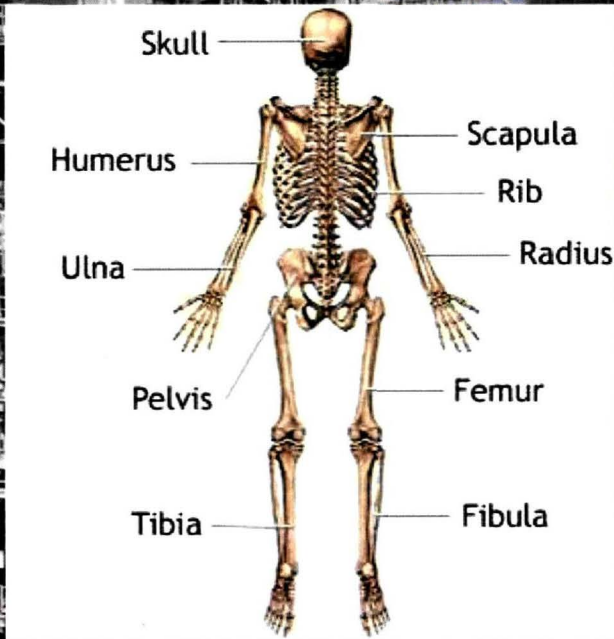


Human vs. Shuttle Systems

Skeletal

Human

Orbiter

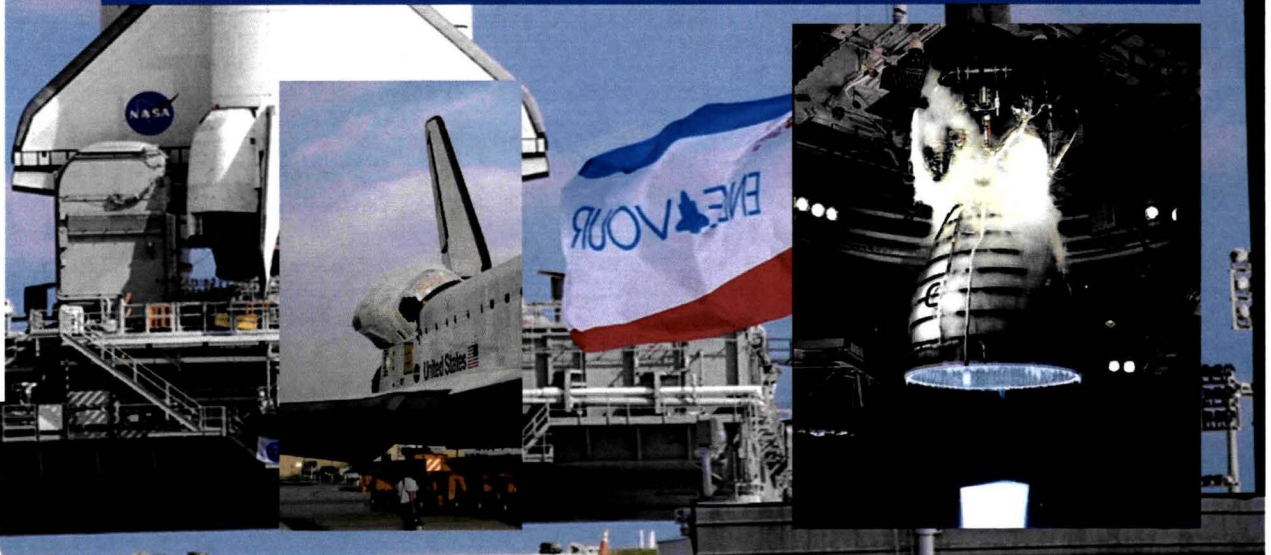
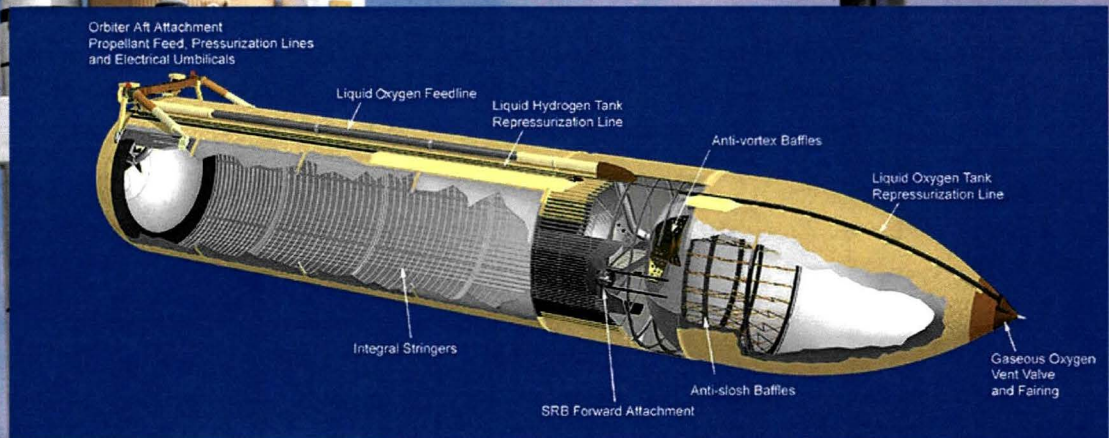
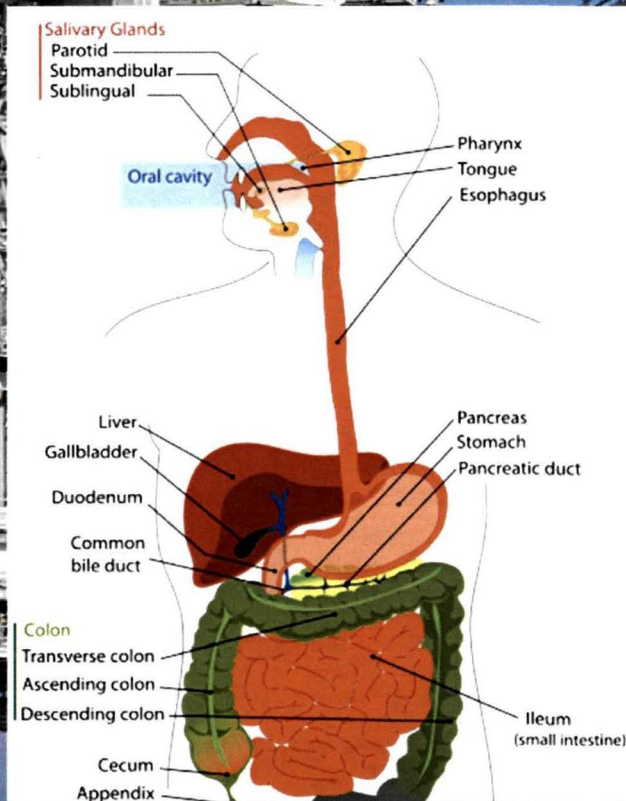


Human vs. Shuttle Systems

Digestive

Human

Shuttle

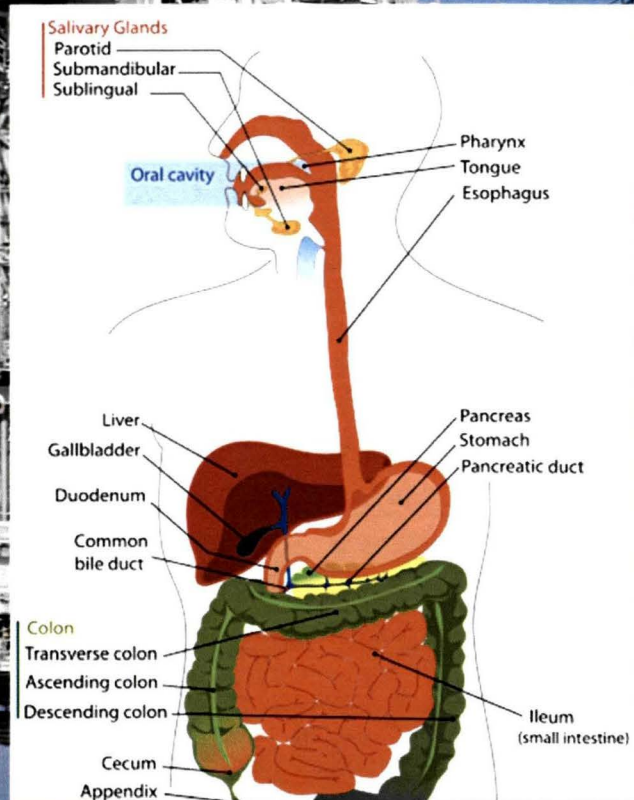


Human vs. Shuttle Systems

Digestive

Human

Orbiter

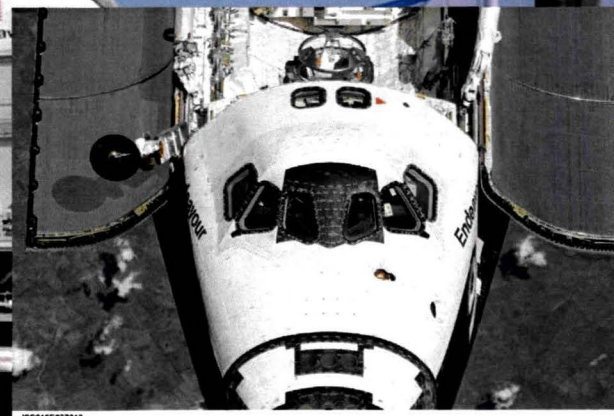
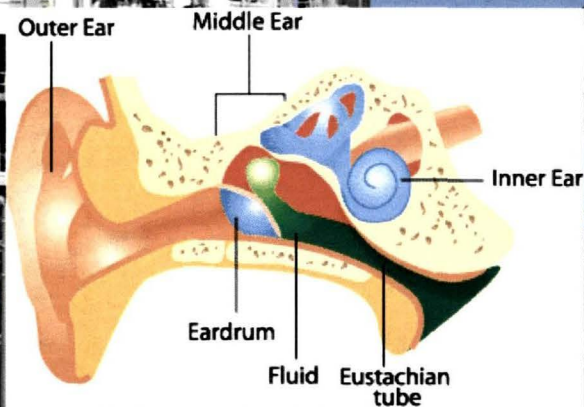
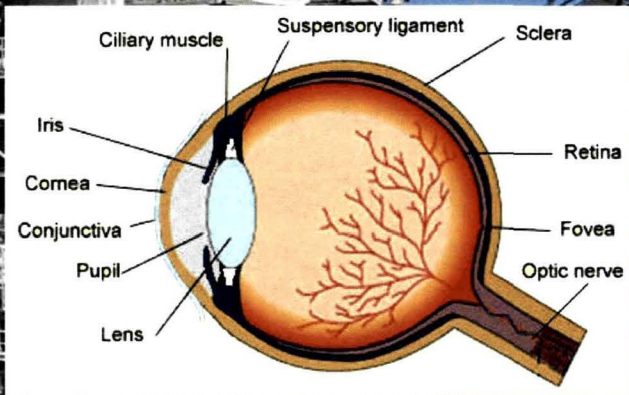


Human vs. Shuttle Systems

Senses

Human

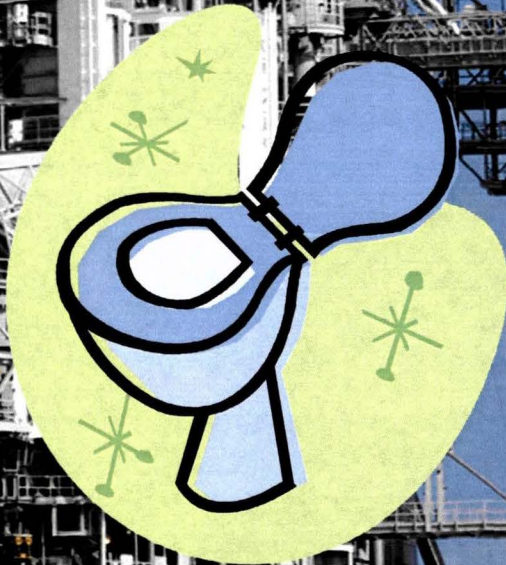
Shuttle



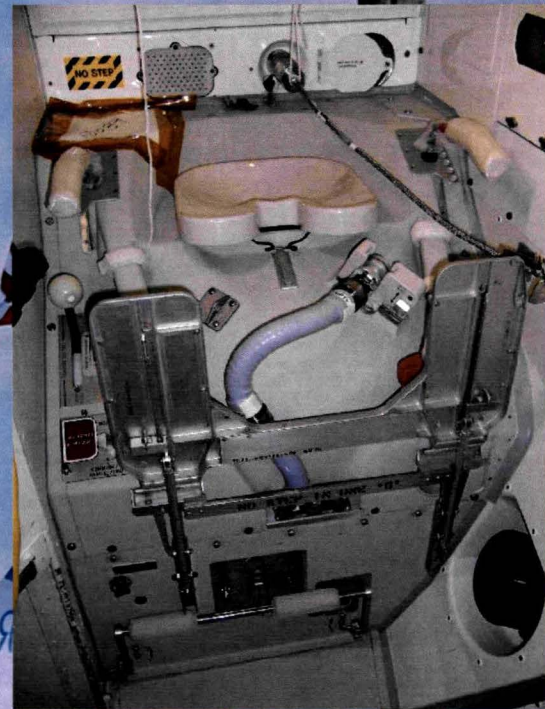
Human vs. Shuttle Systems

Waste Management

Human



Shuttle

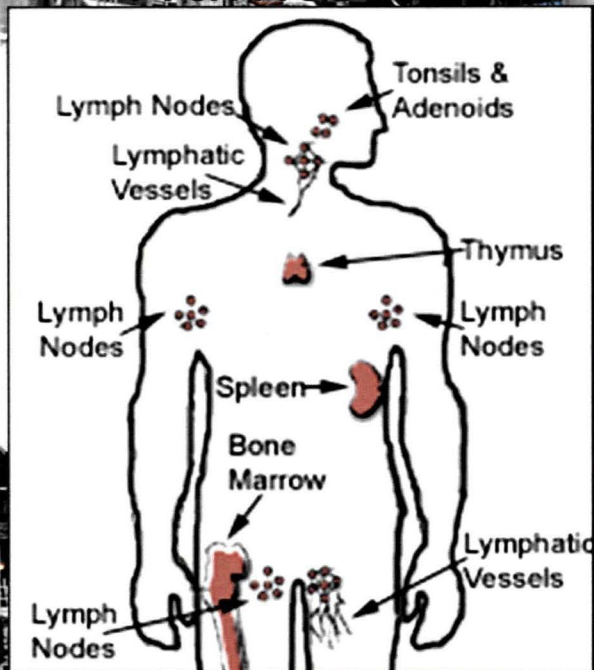


Human vs. Shuttle Systems

Health

Human

Shuttle

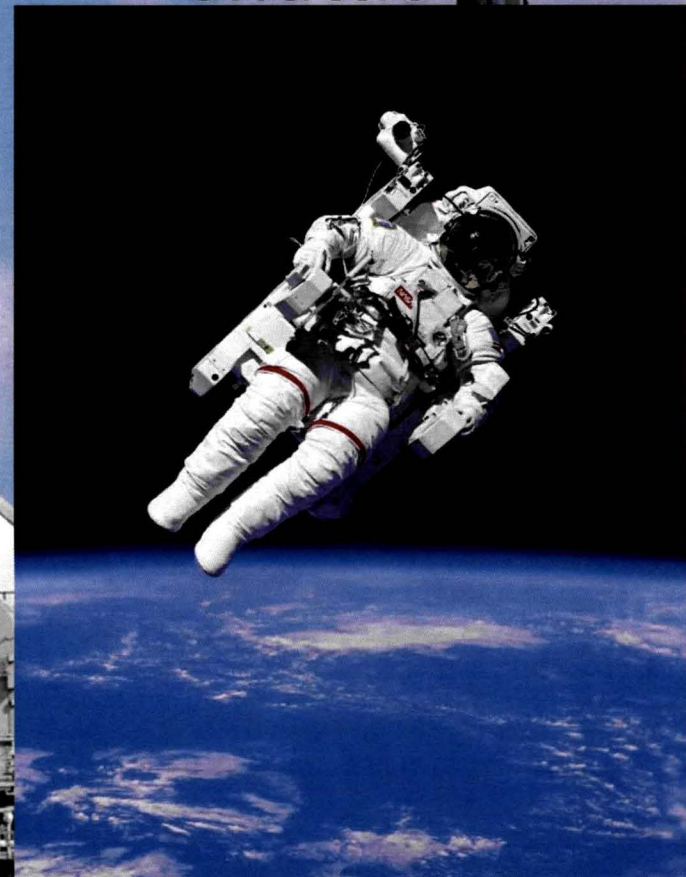
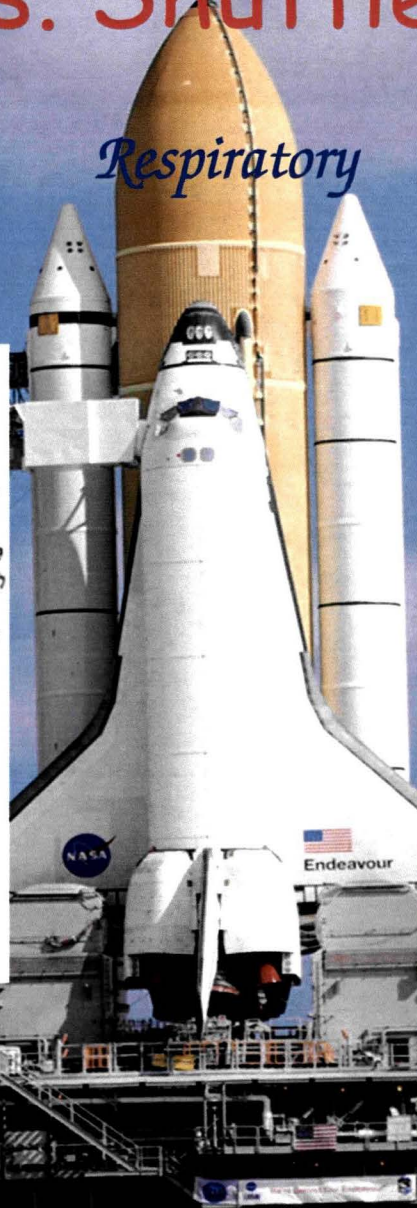
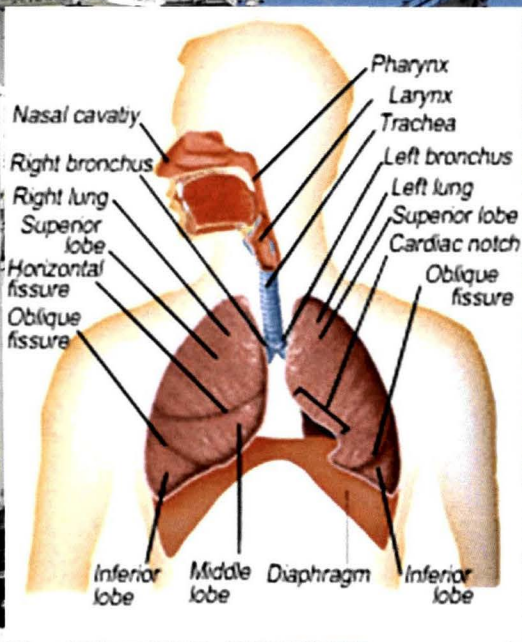


Human vs. Shuttle Systems

Respiratory

Human

Shuttle

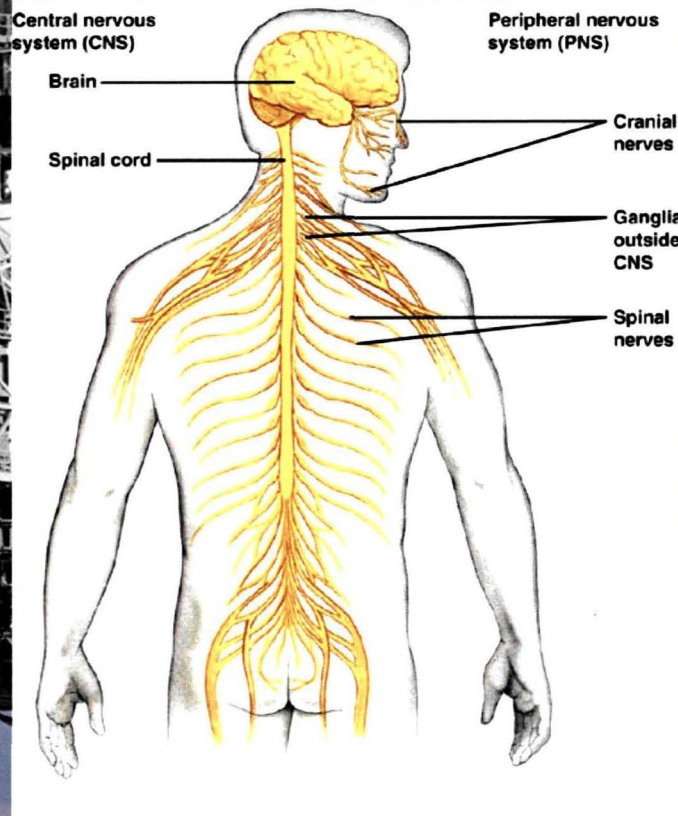


Human vs. Shuttle Systems

Nervous

Human

Shuttle

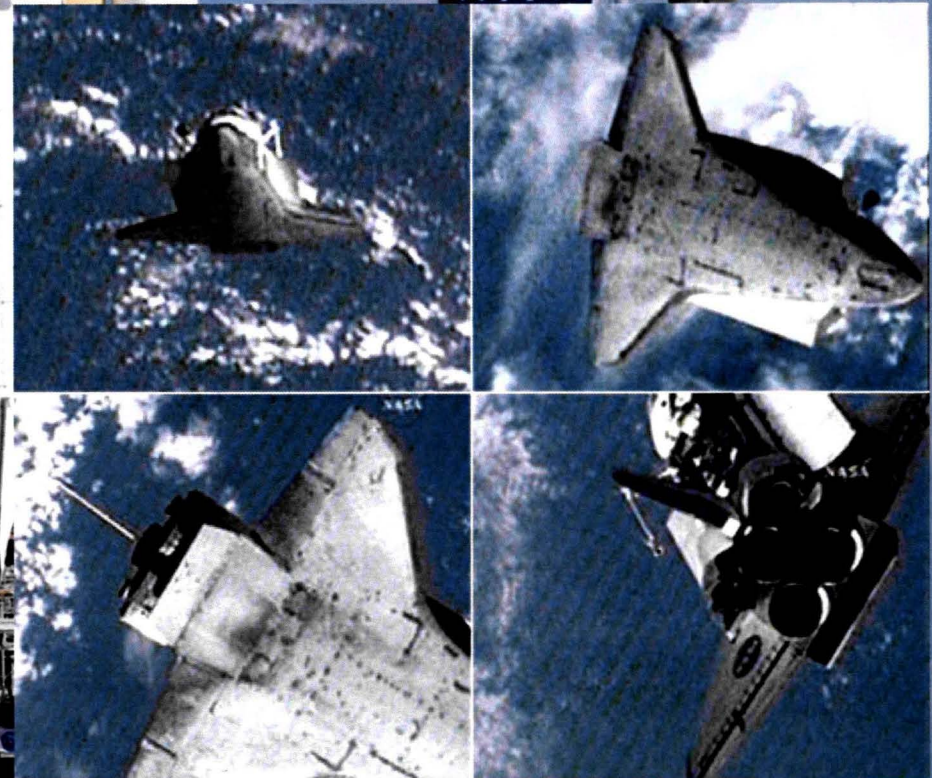
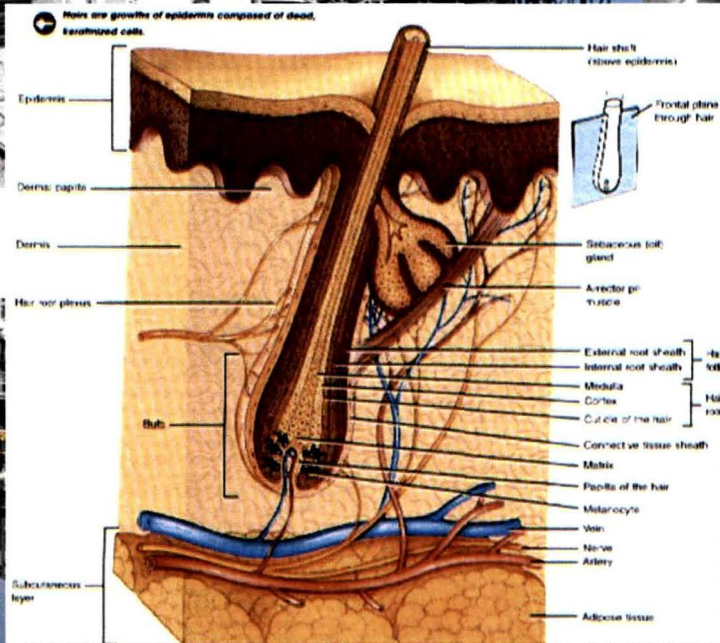


Human vs. Shuttle Systems

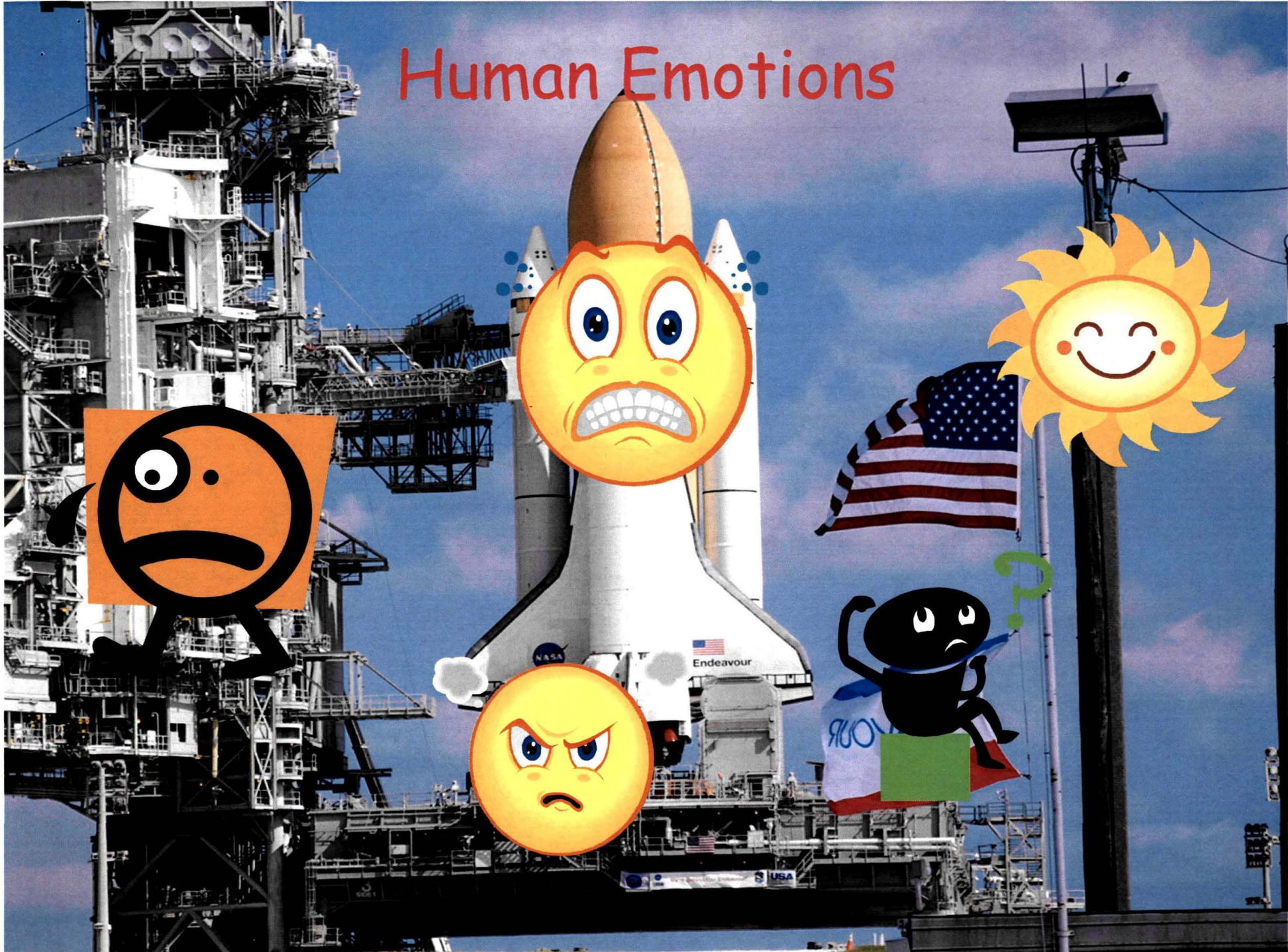
Integumentary

Human

Shuttle

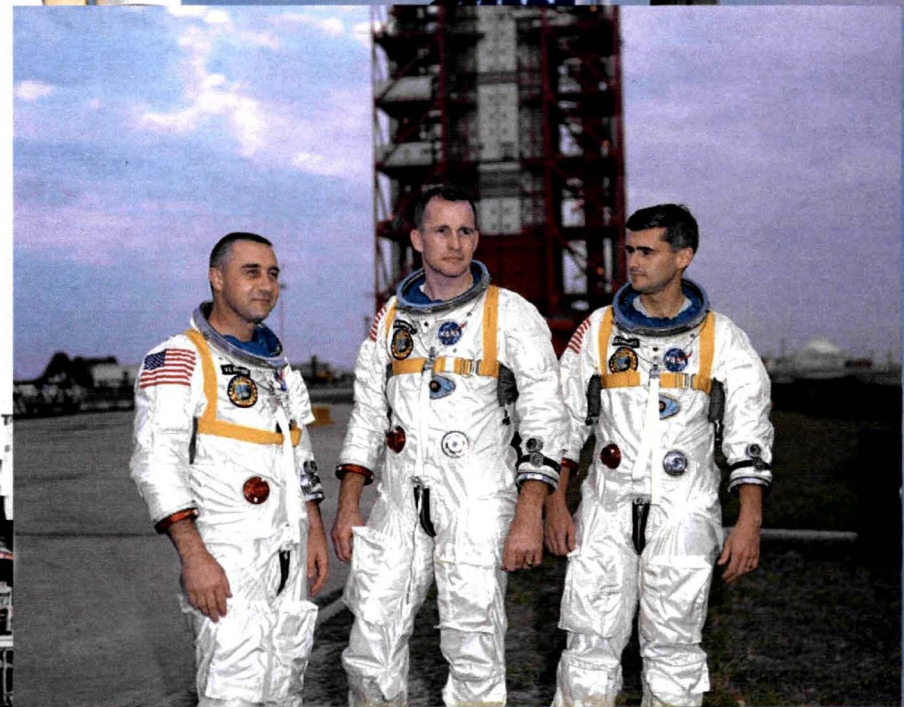


Human Emotions

A collage of human emotions overlaid on a photograph of the Space Shuttle Endeavour being launched. The background shows the shuttle ascending from the launch pad, with the American flag and various launch pad structures visible. Overlaid on the image are several cartoonish representations of emotions: a large yellow emoji with a wide-eyed, screaming expression (fear or shock) in the upper center; a smaller yellow emoji with a frowning, angry expression (anger) in the lower center; a black stick figure with a sad face and a single tear (sadness) on the left; a smiling sun with a happy face (happiness) on the right; and a black stick figure with a confused expression and a question mark above its head (confusion) in the lower right. The overall composition suggests a connection between the awe and excitement of a major event and the range of human emotions it can evoke.

Emotional Side of Human Spaceflight

- Apollo 1 On Pad fire on January 27, 1967
- During a launch rehearsal, fire broke out in the crew cabin, killing all three crew members
 - Virgil "Gus" Grissom
 - Edward "White" White
 - Roger Chaffee



Emotional Side of Human Spaceflight

- January 28, 1986 – Challenger
 - 73 seconds after launch
 - All 7 crew members lost
 - Francis “Dick” Scobee
 - Michael Smith
 - Ellison S. Onizuka
 - Judith A. Resnick
 - Ronald McNair
 - Sharon Christa McAuliffe
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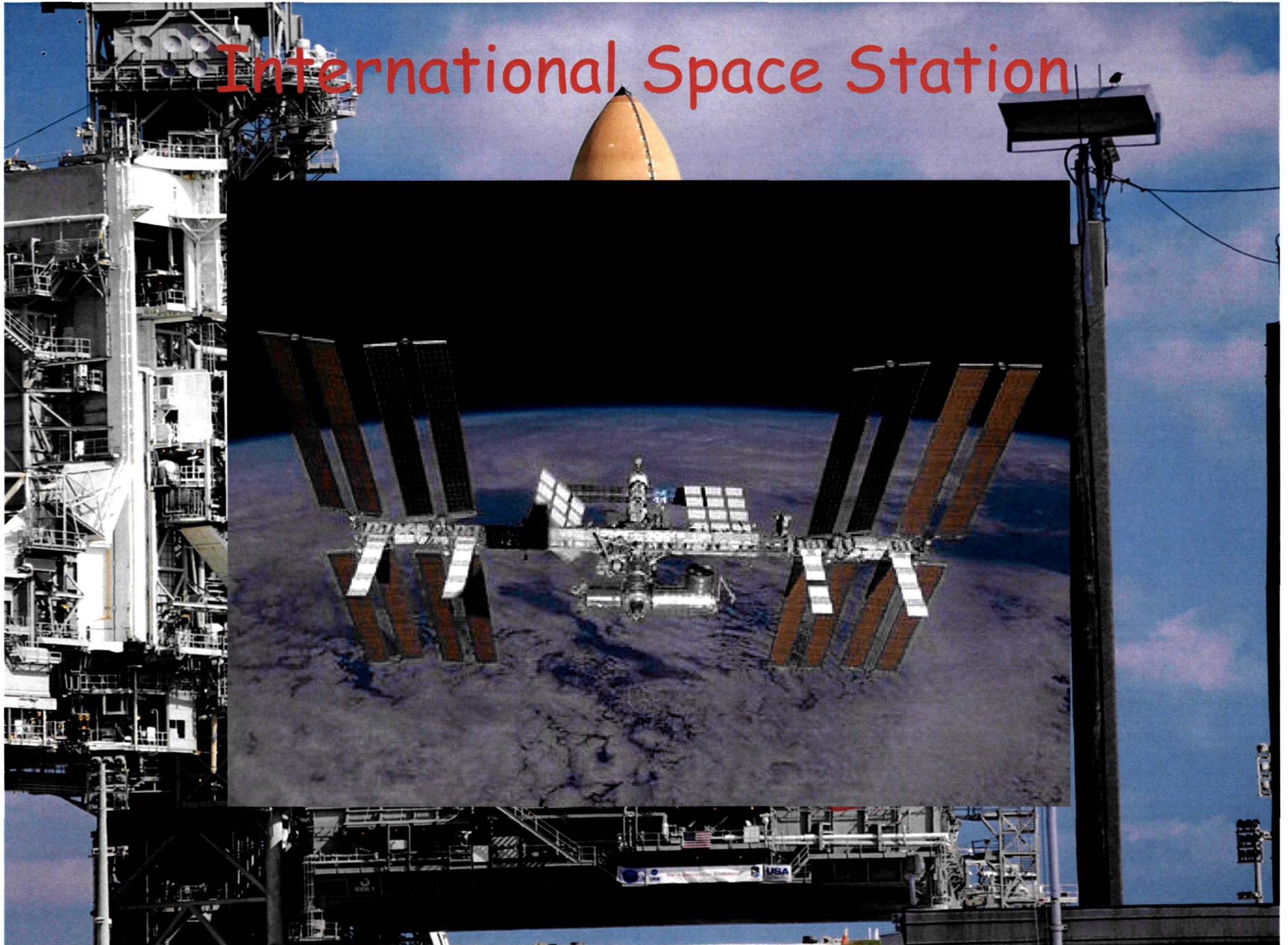
Emotional Side of Human Spaceflight

February 28, 2003

- 15 minutes before touchdown
- All 7 crew members lost
 - Rick Husband
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 - David Brown
 - Kalpana Chawla
 - Michael Anderson
 - Laurel Clark
 - Ellison S. S. S. S. S.



International Space Station



Future of Human Spaceflight

Ares 1-X

- Test vehicle for the Constellation Program
- Aimed at returning humans to the moon and on to Mars

Test flight occurred on October 28, 2009

flight cancelled

October 11, 2009



Future of Human Spaceflight

- NASA Programs

- SLS

- Orion

- Commercial ventures

- SpaceX

- Sierra Nevada

